

Elevated Blood Lead Levels of Children at Age Three Given Low Levels at Ages One and Two



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Lead Hazard & Exposure

➤ Attributed to:

- Learning disabilities
- Shortened attention span
- Lower IQ
- Behavior problems
- Growth delays
- Damage to multiple organs
- Death



Source: Home*A*Syst



➤ Deteriorating surfaces with lead-based paint

- Paint flaking, chipping, peeling, and dusting
- Windows, door frames, and porches
- Contamination of house dust and residential surface soil

Susceptibility of Children

➤ Ingestion

- most common route

➤ Sociological risk

- crawl and play on the floor
- put objects in their mouth (pica)

➤ Physiological risk

- greater absorption due to developing body
- less protection due to developing organ systems



Source: The LEAD Group Inc.

Blood Lead Tests

- Taken at well-child visits
 - Few distinguishable symptoms
 - Unless suspected exposures
- Venous test preferred over capillary
 - Medical lab draw sites
 - Health care provider offices
- Sent for analysis to blood lead laboratories
- Recorded in Childhood Lead Registry
- CDC & AAP recommends
 - Elevated blood lead (EBL) level = $10 \mu\text{g}/\text{dL}$
 - 1991 - universal screening for ages 1 and 2
 - 1997 - statewide targeted screening



Maryland



- 1997 - Childhood Lead Screening Law
 - Collaborative effort of DHMH and MDE
- 2000 - Maryland Childhood Lead Screening Program
 - Managed by the Center for Maternal and Child Health
 - Identify at risk communities by census tract
 - Blood test for all children up to age six who had an affirmative answer to a lead risk questionnaire
- Universal testing for ages one and two living in risk area

Risk	High	Moderate	Low	Negligible
% Predicted EBL	>16%	5-16%	1-4%	unknown
# Census Tracts	46	77	238	790

Methods

Age (months)	9-15	15-21	21-27	27-33	33-39
Age (years)	1	not used	2	not used	3
Average BLL ($\mu\text{g}/\text{dL}$)	1.6	5.3	4.2	7.4	5.5

# Tests @ each Age	Single Test	Multiple @ Age 1 or 2	Multiple @ Age 3	Total
Blood Tests	1,163	212	51	1,426
Children	1,163	100	22	1,285

- Venous over capillary, then test closest to actual birthday
- Follow-up testing:
 - age one to two: 23,000
 - age two to three: 4,300

Hypothesis

Age (years)	1	2	3
BLL ($\mu\text{g}/\text{dL}$)	<10	<10	≥ 10
%	100%	100%	1%



H_0 : probability of EBL at age 3 $\geq 1\%$

H_a : probability of EBL at age 3 $< 1\%$

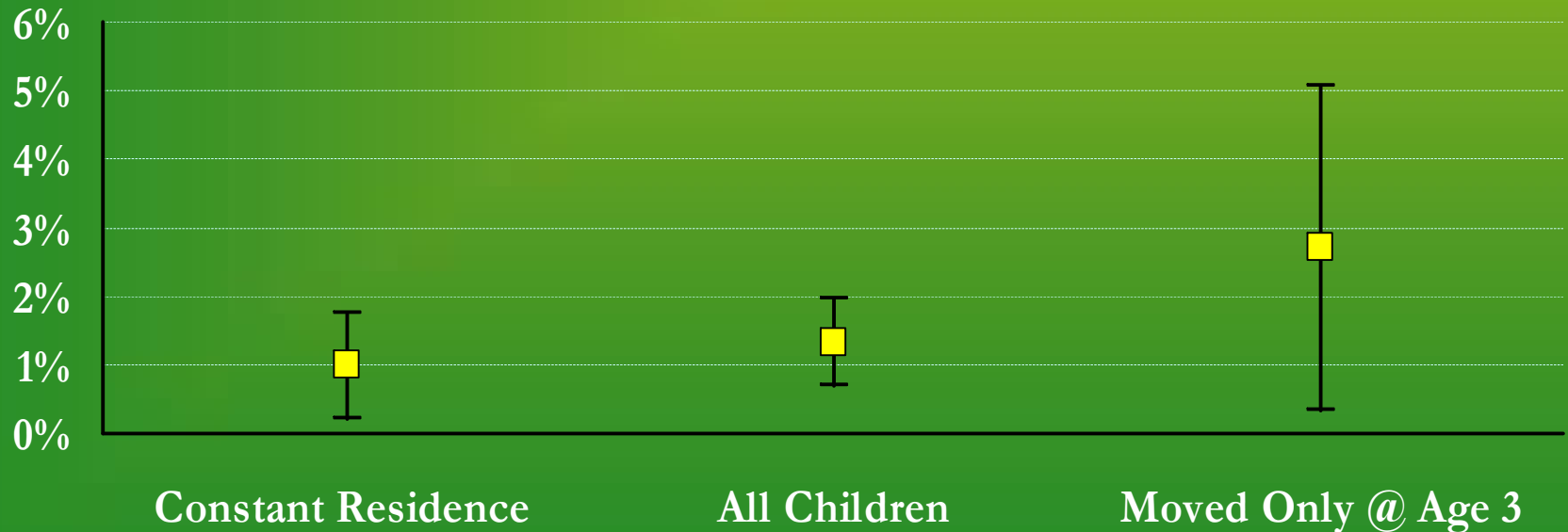
Assumptions:

- All blood lead level (BLL) tests < 10 at ages one and two
- Change in residency if blank

Results

Children at Age Three with BLL $< 10 \mu\text{g}/\text{dL}$ at Ages One and Two

	Constant Residence	All Children	Moved Only @ Age 3
All	615	1285	185
BLL $\geq 10 \mu\text{g}/\text{dL}$	6	17	5



Results

Children at Age Three with BLL $< 10 \mu\text{g/dL}$ at Ages One and Two

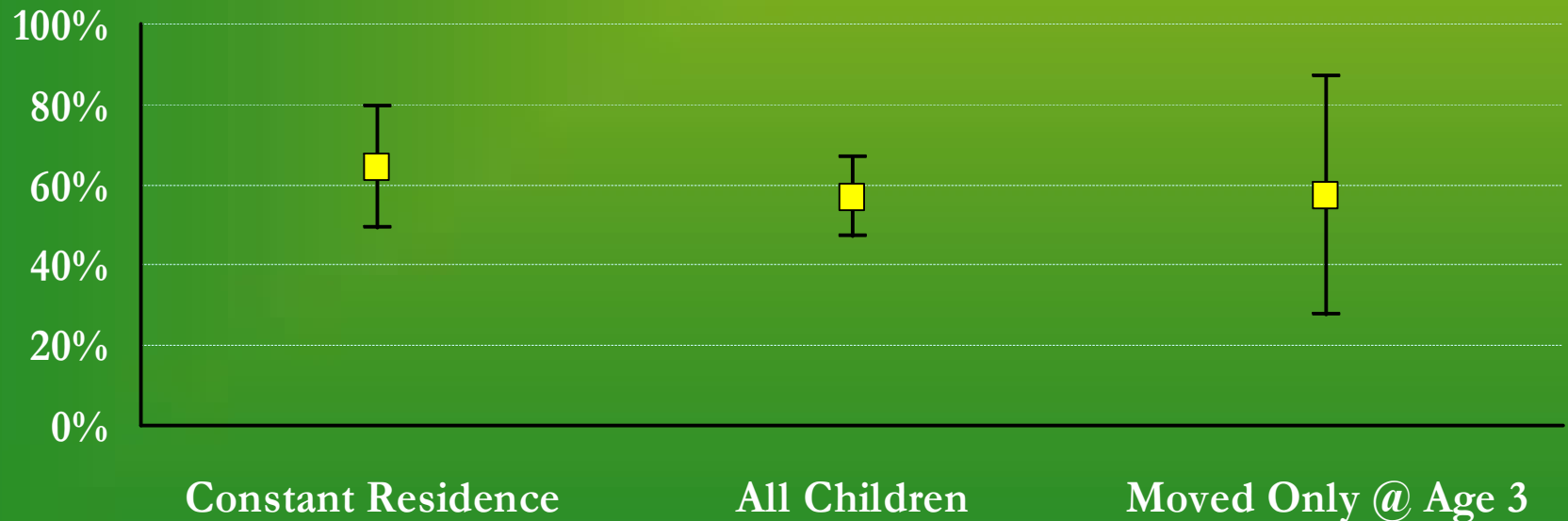
	Constant Residence	All Children	Moved Only @ Age 3
All	615	1285	185
BLL $\geq 5 \mu\text{g/dL}$	86	211	33



Results

Children at Age Three with BLL $\geq 5 \mu\text{g/dL}$ at Ages One and Two

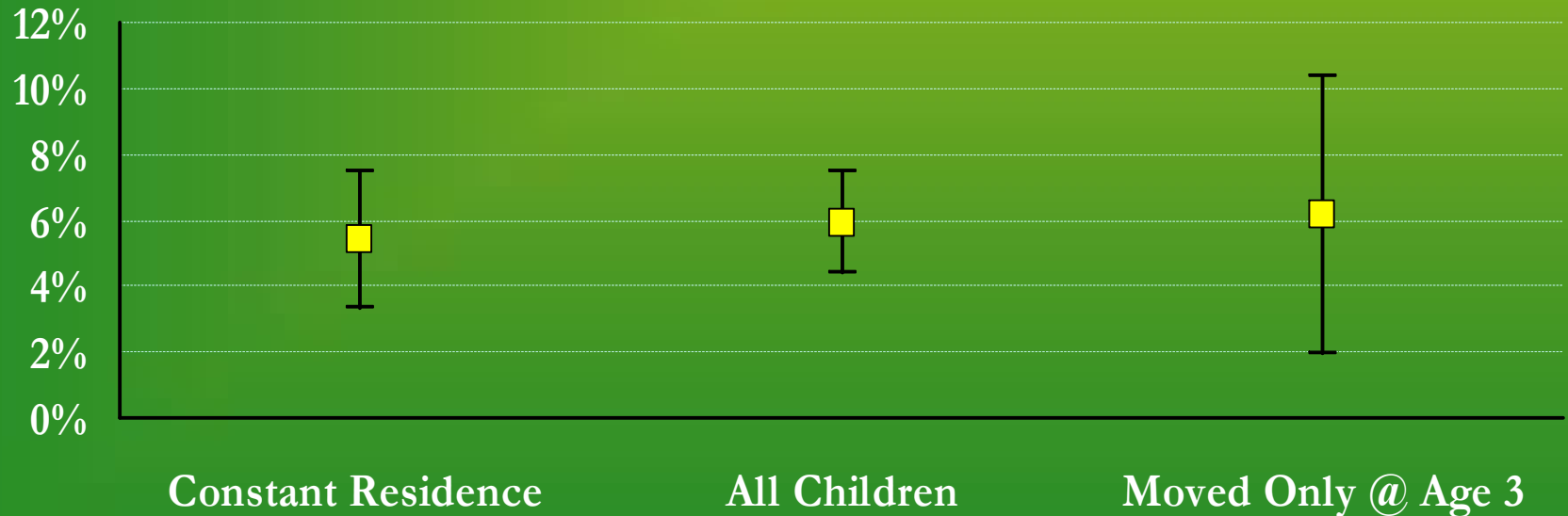
	Constant Residence	All Children	Moved Only @ Age 3
All	42	100	14
BLL $\geq 5 \mu\text{g/dL}$	27	57	8



Results

Children at Age Three with BLL $< 5 \mu\text{g/dL}$ at Ages One and Two

	Constant Residence	All Children	Moved Only @ Age 3
All	464	912	130
BLL $\geq 5 \mu\text{g/dL}$	25	54	8



Recommendations



➤ Primary Prevention

- Anticipatory guidance through parental education
- Further lead abatement in old housing

➤ Secondary Prevention

- Universal blood lead testing up to age three
- Targeted screening to consider change in residency

➤ Future Studies

- Maryland prospective study
- Similar studies in other states